Experimental disconnection from common mycorrhizal networks has little effects on competitive interactions among common temperate grassland species

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Abstract: 1) The extent to which plants can reduce nutrient concentrations in soil and thereby compete with others may increase with nutrient mobility. Hyphae of arbuscular mycorrhizal fungi (AMF) can extend the soil volume from which plants acquire phosphorus (P), thus increasing competition for these resources with neighbours. In this study we tested whether the suppression of hyphal interconnections between neighbour plants mitigates their competitive interactions and consequently affects plant community structure. 2) We used custom-built microcosms that used a wire system to suppress the development of a common mycorrhizal network (CMN) between plant neighbours. We applied this CMN treatment to plants without neighbours (competition-free controls), with conspecific neighbours (monocultures), or with heterospecific neighbours (two and four species communities), all assembled from two pools of four separate temperate grassland species each. We analyzed changes in species and community-level productivity and P acquisition. 3) The CMN treatment affected species differently. Most species had reduced shoot biomass while root biomass increased with CMN disconnection. Productivity and nutrient acquisition of Plantago lanceolata in four-species mixtures was negatively affected, leading to a less even distribution of P among species, but community-level P acquisition was not affected. On average, two-species and four-species mixtures produced similar community biomass and had the same P content as monocultures. 4) Synthesis: CMN disconnection did affect competitive interactions among species only little. One explanation may be that the absence of pronounced competitive hierarchy among the species investigated led to relatively symmetric interactions among species that were stable with respects to additional CMN-effects. Another explanation is that CMN effects are less important in natural soils with natural AMF communities than experiments with few AMF strains and often sterilized soils suggest.

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